Musa Disease Fact Sheet N° 6

BUGTOK DISEASE OF BANANA

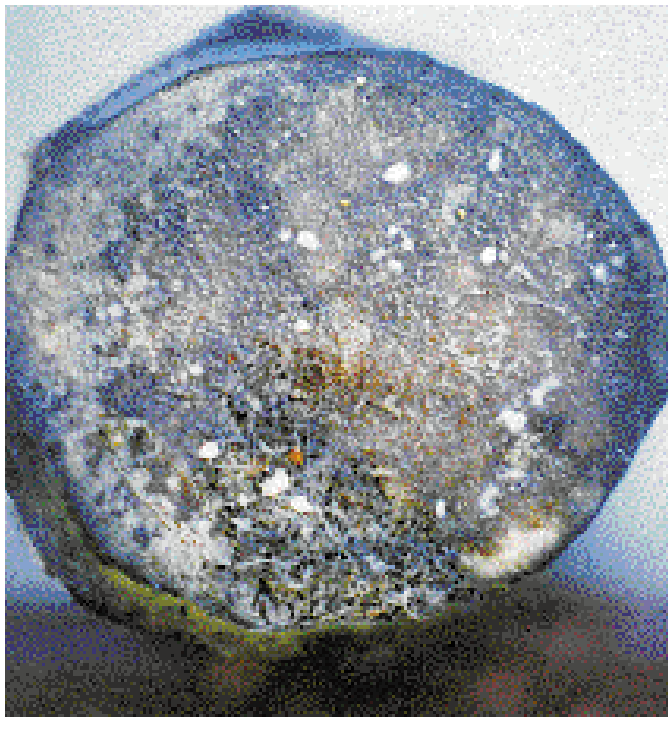
C. E. Soguilon, L. V. Magnaye and M. P. Natural (October, 1995)

Bugtok is an endemic and a widely distributed bacterial disease of cooking banana cultivars in the Philippines. Bugtok is a local term in the southern Philippines used to describe the infected fruit which are discolored and hard even when ripe. It was noted as a minor disorder more than 40 years ago, but was reported by Roperos in 1965 as a developing problem of importance. The disease has recently caused the virtual abandonment of plantations of Saba and Cardaba (ABB/BBB), two of the most popular cooking bananas in the country.

Studies on the etiology of bugtok began in 1990. It is caused by *Pseudomonas solanacearum* E. F. Smith. The bacterium can be isolated from the milky substance that oozes from bracts detached from infected male inflorescences. It can also be isolated from droplets of bacterial ooze, which vary in color from white to yellow to reddish brown, that exude from cut peduncles held under moist conditions. The bacterium is a Gram-negative rod, aerobic, catalase positive, produces hydrogen sulphide from cysteine and elicits a hypersensitive response on White Burley tobacco. The colonies that develop after 72 hours incubation at 28°C on tetrazolium chloride agar medium are typical of *P. solanacearum* being 0.5 to 4.5 mm in diameter, irregular, convex and fluidal with or without a pink formazan center. The bugtok bacterium cannot be differentiated from the Moko disease (banana bacterial wilt) bacterium on cultural, morphological and biochemical characteristics nor by genetic analysis using RFLP-PCR techniques. Some isolates of bugtok easily cause wilt in tomatoes. Other isolates do not, although these isolates consistently cause wilt in artificially inoculated banana plantlets.

External diagnostic symptoms of bugtok can be seen only in plants with undetached male inflorescence. In diseased plants, the old bracts do not dehisce (left) giving a dry, loose appearance. A healthy bunch on the right shows a clean, long male axis bearing the male inflorescence.

Bacterial exudates from freshly opened, infected male inflorescence (right) and from infected male axis (below) incubated for 2 weeks.



International Network for the Improvement of Banana and Plantain, Parc Scientifique Agropolis,
34397 Montpellier, Cedex 5, FRANCE - Tel: (33) 67 61 13 02, Telex: 490376F, Fax: (33) 67 61 03 34

The most discernible symptom of the disease is the discoloration of the fruit pulp which is most intense at the core. In fruit with a slight infection, the discolored parts are interspersed with soft fruit pulp. All fruits within a bunch can be discolored in severe infections, but the distribution of discolored fruits within a bunch is random in plants which are less severely infected.

Unlike Moko disease, bugtok infected plants appear outwardly normal to the untrained eye. The leaves remain green and fruit seems to develop normally. However, the bracts of the male inflorescence, if left in the fruit bunch, fail to dehisce. This gives the male inflorescence a dry and loose appearance. This character is the only external symptom that can differentiate healthy from infected plants. Internally, brown vascular streaks can be observed in the fruit peduncle, the fruit stem and the pseudostem. Browning is less intense at the base of the pseudostem but discoloration sometimes extends to the corm of the plant.

There is convincing evidence that infection occurs via the inflorescence, and that bugtok disease is transmitted by insects, probably thrips. Bagging the young inflorescence as it emerges from the crown produces bugtok-free fruit, an indication that insect vectors play a role in the spread of the disease. Sucker transmission is unlikely since planting material collected from highly affected mats growing in bugtok-free areas produce healthy fruit.

Bugtok is very common in backyards where Saba and Cardaba are planted. However, the following cultivars planted at the Davao National Crops Research and Development Center were also affected: Mundo, Turangkog, Paa Dalaga, Biguihan, Inabaniko and Java (ABB/BBB genome); Gubao, Katsila, Pelipita, Maduranga, (ABB genome) and Giant Kalapua (ABBB genome). This indicates that cultivars possessing the 'B' or *Musa balbisiana* genome are susceptible to bugtok.

Bugtok can be controlled by bagging the inflorescence at the bending stage just after emergence. The bagging material can be a polyethylene bag, muslin cloth, or a fine nylon mesh bag. Bags can be removed after all the fruits have set if followed by removal of the male inflorescence. This practice should also include mat and field sanitation, and removal of old, dead leaves. Injecting the male inflorescence with insecticide, as practised by commercial plantation to control thrips, was not as effective as bagging.

There is very little information on the pathogenic relationship of the bugtok and Moko bacteria and on the survival/persistence of the bugtok bacterium in the soil or on plant debris. Also, the insects that transmit bugtok have not been identified. More work needs to be undertaken to resolve these issues and also which cultivars are susceptible and resistant to bugtok.

The Bureau of Plant Industry (BPI), the University of Philippines at Los Baños (UPLB) and INIBAP are key partners and investigations on bugtok continue in the Philippines.

Control of bugtok involves bagging the inflorescence at bending stage (above).
Fruit showing discoloration of the pulp due to bugtok (below).